

CONTRIBUTIONS TO THE CYTOLOGY OF THE
ENTOMOPHTHORACEAE: PRELIMINARY
COMMUNICATION.

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FOR the past two years the writer has been engaged in a study of the cytology of certain species of *Empusa* and of *Entomophthora*. One species of *Empusa* and four species of *Entomophthora* have been examined.

It has been found that the nucleus of *Entomophthora* has a highly developed structure, showing little resemblance to the nucleus of the Yeast, as Cavara suggested. Further the nucleus of *Entomophthora* undergoes a more or less typical mitotic division. The resting-nucleus shows a rather small nucleolus surrounded by a densely granular chromatin-content, which may at times appear as a network. During prophase the chromosomes (of which there are 8 in *E. Americana*) are formed by the direct aggregation of the chromatin-granules, without the intervention of a spireme-stage. This drawing together of the chromatin leaves evident a number of linin-fibers, running from the spherical chromosomes to the nuclear-wall which persists throughout mitosis. These linin-fibers gradually separate into two groups which draw toward the respective poles, forming a typical, intranuclear bi-polar spindle. No centrosomes were seen in any case. The so-called nucleolus appears to be strictly a karyosome, as it is identical with the chromosomes in appearance and behavior during division. The later phases of mitosis are much as in other cases.

The nuclear details of zygosporo-formation agree essentially with those described by Gruber for *Sporodinia*; and the process in general shows a close agreement with conditions in the Mucorales. The zygosporo either buds out at the point of fusion of the hyphal bodies (compare the conditions in *Piptocephalis*) or else buds out from one of the gametes (compare the conditions in *Syncephalis nodosa*). In either case the fusing hyphal bodies are multinucleate structures and are therefore coenogametes — a type of sexual organ shown by Davis and others to be characteristic of the Phycomycetes. The entire contents of both gametes, including all of the nuclei, pass into the young zygosporo. No fusion of the nuclei occurs during the first

three months. Whether or not fusion in pairs occurs at the time of germination, as we should expect, it has been so far impossible to determine, owing to the difficulty of germinating the zygospores.

The formation of the azygospores in *Empusa* was found to present conditions quite different from those described by Vuillemin for *Entomophthora gleospora*. In the case of *Empusa* the entire contents of the hyphal body, including all of the nuclei, which may number over 40, pass into an ampulla which is cut off, forming the azygospore. No further changes take place in these nuclei so far as has been observed. The writer offers the suggestion that this structure is in the nature of a chlamydospore, a view which is further supported by the fact that an encysted hyphal body, as a means of tiding over the winter, may frequently be substituted for the usual azygospore.

The cytological conditions show that *Entomophthora* is a more highly developed genus than *Empusa*. The general results here described bring these genera into complete accord with the conditions known in other *Phycomycetes*. The complete paper presenting in full the evidence for the statements here made is now in preparation.

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A NEW STATION FOR ASPLENIUM EBENOIDES.—Just outside the town of Salisbury, Vermont, there is, a few feet from the roadside, an open grove of trees, surmounting an out-cropping ledge of limestone. On this ledge I found *Asplenium ebeneum* and *Camptosorus rhizophyllus* in abundance, but search failed to discover *Asplenium ebenoides* among them. About fifty feet away, however, in the open pasture the limestone again jutted out, and here I found a large plant of *A. ebenoides*, from which a frond was sent to the Gray Herbarium where the identification was confirmed. A smaller plant some five feet away and still a third, very small and just assuming shape, were found. *A. ebeneum* grew profusely upon this rock, but I found only a few inferior plants of the walking-leaf.—ANNA W. SMITH, West Brattleboro, Vermont.

[It is believed that the locality, here reported by Miss Smith, is by a few miles the most northern station for *A. ebenoides* as yet recorded, at least in New England.—Ed.]